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Analysis of the freight of handysize ships on the global bulk shipping market

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DECLARATION

I certify that all the materials in this research paper that are not my own work have been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this research paper reflect my own personal views, and are not necessarily endorsed by the University.

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Title:Study on the freight of handysize ships on the global market

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ABSTRACT

Handysize is a navy architectural term for small bulk carriers or tankers.In fact, the bulk carrier market has evolved into several different scale regions, each focusing on different trading sectors.The handysize bulk carriers are more abundant in terms of cargo, and their operating routes are also more flexible.

This research paper is a Study on the freight of handysize ships on the global market.

The focus point on this study is the analyse of some factors that influence the freight of handysize ships market such as the supply and demand of the shipping market and some important random events .

The method used in this paper is regression equation fitting. This mathematical method can analyse the data of freight and BHI. Then the relationship between data and factors can be summarized.

KEY WORDS: handysize, freight rate, BHI, supply and demand, random events

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ARMA	Auto-Regressive Moving average model
ASEAN	Association of Southeast Asian Nations
BDI	Baltic Dry Index
BHI	Baltic Exchange Handysize Index
DWT	Dead Weight Tonnage
ITL	International Transport and Logistics
VAR	Value At Risk
WTO	World Trade Organization

CONTENT

CHARPTER 1 Introduction

1.1 Background

Shipping is a fascinating business. Since the first shipment was shipped by sea more than 5,000 years ago, it has been at the forefront of global development. The voyages of Columbus, Diaz, and Magellan opened the world's maritime highways, and the pioneering spirit brought supertankers, container ships, and complex fleets of dedicated ships that transport one ton of goods each year for everyone in the world. This is very exciting. The massive shipping boom of 2004 has transformed the entire industry from poverty to wealth in just over a year, making its lucky investors one of the richest people in the world.

Handysize is a navy architectural term for small bulk carriers or tankers with a carrying capacity of no more than 50,000 tons. Their small size allows the Handysize ships to enter smaller ports for the pickup of goods, and because in most cases they are equipped with cranes, they can often load and unload cargo in ports that lack cranes or other cargo handling systems.

Compared to large bulk carriers, Handysize transports more types of cargo. Handysize bulk carriers are mainly engaged in the transportation of small bulk cargoes and grain, but also can carry iron ore and coal. Most of them are transported by the whole ship. The goods carried are usually cheap, and have low requirements for delivery speed. No need or need more simple packaging. At present, more than 50% of the world's grain shipments are handled by Handysize vessels, because the grain transportation routes are mostly exported from developed countries to less developed countries.

Small bulk cargoes mainly include nickel ore, cement and cement clinker, steel, fertilizers, manganese ore, scrap, sulfur, salt, bauxite, sugar, petroleum coke, and

forestry products. Judging from a single type of goods, they have little impact on the global dry bulk shipping market. However, if all the bulk cargoes are combined, their impact and role cannot be ignored. These cargoes are widely distributed and small in volume. They are regional, seasonal and continuous, and have formed a stable scale.

Handysize bulk carriers are mainly built by shipyards in Japan, South Korea, China, Vietnam, the Philippines and India, although other countries have the ability to build such ships. The most common industry-standard handysize bulk carriers now have approximately 32,000 metric tons of load during a summer draft of approximately 10 meters (33 feet), and have 5 cargo holds with hydraulically operated hatch covers, and 4 for 30 metric tons of cranes for cargo handling. Some handysize also have pillars that enable wood to be stacked on deck. This type of vessel is often referred to as a "convenient lumberjack." Despite the recent orders for new ships, handysize ships are still the highest in the average age of the major bulk carriers.

In fact, the bulk carrier market has evolved into several different scale regions, each focusing on different trading sectors, so that bulk carriers' ships are evenly distributed across the scale, at the smaller end, handy bulk carriers of 10,000-40,000 dwt act as flexible workers in the industry where parcel size and draft restrictions require small vessels. In busy sea areas such as Asia, it is usually possible to complete two loading cruises per ballast voyage. This is a major improvement over the larger bulk carriers that often replace loading and ballasting.

With the improvement of the port in the past 20 years, a new generation of large 40,000-6,000 dwt Handy bulk carriers have emerged, commonly referred to as the Handymax bulk carriers. Like Handy Bulk Carriers, these ships are generally geared. The market center is a Panamax-type bulk carrier with 60,000 to 100,000 DWTs and serves coal, grain, bauxite and larger minor bulk cargoes. These medium ships are named Panamax ships because they can pass through the Panama Canal, but the larger-end ships in the range are too large to do so, at least until the canals are extended. At the upper end, bulk carriers of 100,000 to 300,000 dwt are heavily

dependent on iron ore and coal trade. There are many exchanges between these large-scale groups, and the final choice is to make a trade-off between unit cost and cargo flexibility: small vessels are flexible but expensive, while large vessels are becoming cheaper and inflexible.

Bulk carriers are usually designed for cheap and simple. The key design feature is the cube's capacity to enter cargo holds and cargo handling equipment. Maintaining the design is important because goods such as grains can be easily transferred and, if left unchecked, can tip over the ship. In order to prevent this, bulk carriers usually have an automatic trimming tank in which the top flank tank is inclined so that the granular cargo can be loaded by gravity.

Today, most handysize operate within regional trade routes. These ships are able to travel to small ports with length and draft restrictions and lack of cargo handling infrastructure. They are used to transport small bulk cargoes, and it is common for a single cargo tank to be shipped in packages of different commodities.

The international dry bulk shipping market is a derivative market for international dry bulk trade. Its price is affected by many factors, such as world politics, economy, and oil prices. As a result, the market is volatile and has high risks. At the same time, the international dry bulk shipping market is a completely competitive market. In this market, the shipping company's business objective is to achieve the highest amount of return with the minimum investment while minimizing risks. Handysize bulk carriers are an important part of the international dry bulk shipping market, and they occupy a certain proportion in international dry bulk transportation systems.

Compared with Capesize bulk carriers and Panama bulk carriers, the volume of cargo handled by Handysize bulk carriers is relatively small, but the types of goods they carry are broader. Capesize bulk carriers and Panamax bulk carriers mainly carry bulk cargoes such as iron ore, coal, and grain. These cargo types are relatively fixed in supply areas and supply and demand parties, and they have certain requirements

for port draught and other conditions. The route of these two types of ships is basically fixed. The handysize bulk carriers are more abundant in terms of cargo, and their operating routes are also more flexible.

1.2 The main research content

The first chapter is the introduction part, which mainly introduces the background significance of this topic.

The second chapter is the research summary of related fields at home and abroad.

The third chapter describes totally demand and supply of handysize market and mainly analyzes the influence of the three above factors on freight: handysize market, major events, global sea transport market.

The fourth chapter collects the freight data, BHI index and use the regression equation fitting to analyse.

The fifth chapter puts forward several suggestions on the development of handysize market.

The sixth chapter summarizes the full text and draws the conclusion of this paper.

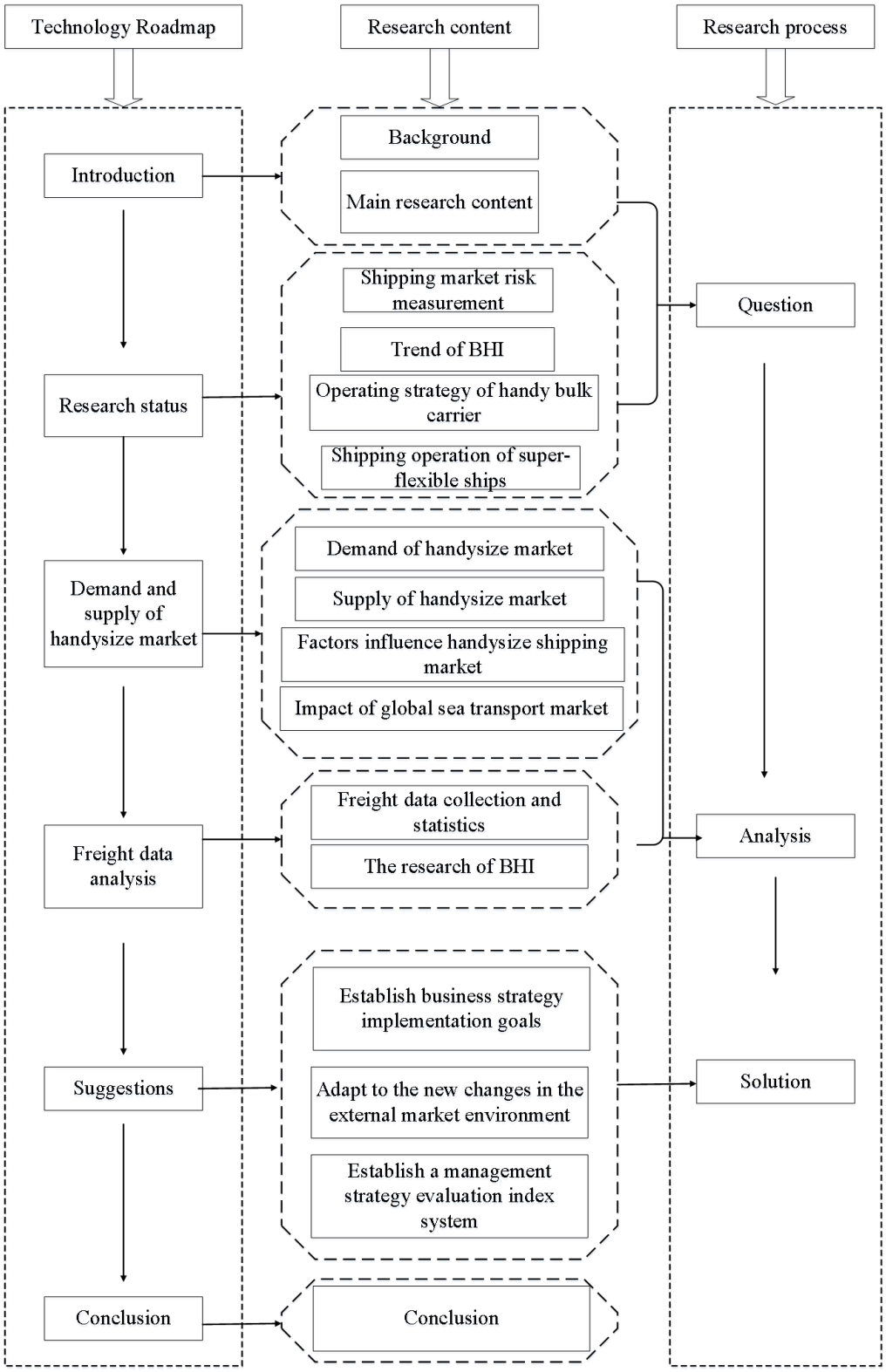


Figure 1-1 Technical roadmap

CHARPTER 2 Research status at home and abroad

Research on shipping market is one of the hottest thesis. To measure the risk of shipping market, predict the trends of dry bulk shipping market and shipping operation of handy bulk carrier and super-flexible ships, numerous mathematical statistics methods are applied to the thesis, such as VAR(Value at risk model) ,ARMA(Auto-Regressive Moving average model) and so on.

Figure 2-1 Research status at home and abroad

2.1 Research on shipping market risk measurement

In the 1980s,JP Morgan was first to put forward a new method: Value at risk, this method of risk measurement gradually was adopted by major financial institutions, and VAR now becoming the main method, But not yet widely applied to the international dry bulk shipping market .As Chinese enterprises participating in the international shipping market deeply, the need for market risk management and control has become increasingly urgent. As the main international dry bulk transportation ship, super handy max bulk carrier has been playing an important role in the international transportation market. Handy max bulk carrier freight risk is set as main research subject, and the VAR model is built up to measure the risk of

shipping market, after quantitative analysis and qualitative analysis.

2.2 Research on the trend of BHI

Zhang Ye, Wang Ying, and Wang Lan, aiming at some problems concerned in the analysis of shipping price index, first used statistical method to verify the dynamic relationship between the small and flexible BHI (Baltic Handy size index) and the market freight rate. The periodicity and trend of BHI itself are studied. Finally, the ARMA(Auto-Regressive Moving average model) used to predict BHI index is established. The research shows that the ARMA (Auto-Regressive Moving average model) can accurately reflect the trend of market freight rate change, although it has a lot of randomness, it can be used as a whole. Based on the analysis and treatment of long-term trend and seasonality, a corresponding prediction model can be established.

2.3 Research on operating strategy of handy bulk carrier

To offer theory and practice guidance for the development of shipping companies，Shi Pengfei pays more attention on handy shipping situations. In the paper, shipping routes, market demand, market supply and the price are totally analyzed. Then, the paper investigates the operational situation in the enterprise, such as the fleet, routes and the cargoes, also the problems are put forward, including fleet age, ship size, proportion of self-owned vessels. Through quantitative analysis and qualitative analysis, Shi Pengfei gives six operational strategies including optimizing the fleet age and ship size, adjustment the proportion of self-owned vessels and operational strategies and service concept, strengthening risk management.

2.4 Research on the shipping operation of super-flexible ships

Wang Cheng, Lin Guolong, Ding Yi, in order to study the volatility of the super stool type shipping price index and to grasp the trend of the super convenient type shipping market, through the analysis and test of the stability and heteroscedasticity of the profit rate sequence of the super stool type ship. The stability and high order heteroscedasticity daily return series are verified. Through the analysis and

comparison, a new model is obtained, which can better describe the volatility agglomeration effect of daily return series. The reason of special fluctuation of index is analyzed in combination with practice. Finally, the order of daily yield is obtained by comparing TARCH model with EGARCH model. The research results can provide decision support for the shipping operation of super-flexible ships.

CHARPTER 3 Demand and supply of handysize market

3.1 Demand of handysize market

Handysize bulk carriers are an important part of the international dry bulk shipping market, and they occupy a certain proportion in international dry bulk transportation systems. They can freely enter and exit most of the ports under full load. Due to its small draught, self-contained cranes and low fuel consumption, the ship is well-suited for maritime activities among ports with poor infrastructure, and can therefore be operated in underdeveloped areas in South America, North-West Africa, Eastern Europe and Southeast Asia. Handysize bulk carriers are named after their convenient operation. Handysize bulk carriers are mainly engaged in the transportation of small bulk cargoes and grain, but also can carry iron ore and coal. Most of them are transported by the whole ship. The goods carried are usually transported in batches, cheap, and have low requirements for delivery speed, no need or need more simple packaging.

Small bulk cargoes mainly include nickel ore, cement and cement clinker, steel, fertilizers, manganese ore, scrap, sulfur, salt, bauxite, sugar, petroleum coke, and forestry products. From a single cargo point of view, they have little impact on the global dry bulk shipping market. However, if all small bulk cargoes are consolidated, their impact and role can not be ignored. These cargoes are widely distributed and small in volume. It is regional, seasonal and continuous, and has formed a stable scale.

Table 3-1 bulk cargoes & routes

Bulk cargo	comments	Main routes
Cereals	Soybeans、Wheat、Corn	from Australia and New Zealand to the China, Japan and South Korea
Nickel ore	mostly shipped outside the	from Indonesia and the Philippines to

Bulk cargo	comments	Main routes
	rainy season	China, Sakamoto and South Korea
Coal	mainly used to generate electricity and produce energy	from Western Australia to China

3.1.1 Cereals

The cargo includes soybeans, wheat, corn, sugar and food products. The main cargo flow on this route is from Australia and New Zealand to the China, Japan and South Korea. In addition, Thailand is the largest exporter of rice in Southeast Asia. The rice is well-known throughout the world and it is mainly sold to ASEAN countries such as Singapore, Indonesia, Malaysia and the Philippines. Due to the low price of corn exported from China and the short distance of sea transport, corn from China has gradually taken a dominant position. Its share has reached 80% of ASEAN's international import volume. China has become the largest supplier of imported corn to ASEAN countries. The production of soybeans in Southeast Asian countries is limited and mainly depends on imports. The traditional suppliers mainly include the United States and Argentina.

From the perspective of the development of the global grain shipping industry, food demand has undergone great changes. The flow of goods has shifted from Eastern European countries and developing countries to the European Union, Japan, and South Korea. The EU, Japan, and South Korea are the main driving forces for food imports. Its grain imports account for about 45% of global grain imports. The main reason for the change in food demand is the abnormal change in the world's climate. If the food in a certain area is reduced sharply due to the climate, the region can only rely on grain imports. This is inevitable. Drive the surge in shipping demand.

3.1.2 Nickel ore

The main routes for nickel mines are Indonesia and the Philippines to China, Sakamoto and South Korea. The cargoes are basically loaded on anchorages and transported by barges ranging from 500-5000 tons to the side of the ship and loaded with ship machines. Ships are required to bring their own grabs. The loading rate of this cargo is low, and the unloading ports are mostly concentrated in China, Japan and South Korea. Nickel ore is an essential raw material for the production of stainless steel, and its iron ore content is as high as 20%. Under the situation of high iron ore prices, many steel companies are willing to use the nickel ore as an alternative to pure iron ore. Since the port loading is mainly concentrated in the tropics, it is affected by the rainy season, and the moisture content of the nickel ore will affect the route safety of the ship. Therefore, it is mostly shipped outside the rainy season. Its main route is Indonesia/Philippines - China/Japan/Korea.

For the operation of Handysize vessels, when the market is low, ships can be considered to carry bulk cement, and ships can be moved from North China to West Africa and the Mediterranean Sea to achieve a rapid shift to the Atlantic Ocean. In addition, during the downturn of the market, it is possible to consider carrying steel from North China to Manila in the Philippines and Jakarta in Indonesia, so as to place the ship in the place of high-value cargo. For the nickel mines in the Philippines and Indonesia, most of the ports are loaded on anchorages, and the barges at these ports do not have lifting capabilities. Therefore, ships are required to bring their own cranes and grabs. In this regard, Handysize bulk carriers have unique advantages. Without relying on shore cranes, it has now become the main ship type for imported nickel ore.

As demand for battery-powered vehicles increases, the demand for nickel alloys will remain strong. After the partial lifting of the ban on nickel exports from Indonesia in 2017, exports began to improve. In 2017, Indonesia’s nickel exports reached 4.9 million tons, and the export volume in 2016 was almost negligible. At the same time, the global nickel ore trade volume increased by 7% year-on-year. In the coming

years, Indonesia's exports will further increase as the government is gradually expanding the export quotas of Indonesian companies. Previously, the country was the world's largest nickel exporter before the ban, but was later replaced by the Philippines. However, with the increase in the supply of Indonesian nickel ore, Philippine miners are under pressure and their export volume decreased by 7.7% in 2017. However, the transfer of trade from Indonesia to the Philippines will be beneficial to the handysize ships. Japan and China are the major nickel importers, and Indonesia is a little further than the Philippines. Therefore, for the same volume of transaction, the handysize ships demand will increase.

3.1.3 Coal

The main flow of coal is imported from Western Australia to China. In Southeast Asia, except for Singapore and Cambodia, other countries produce coal. Although most countries produce some coal resources, only Vietnam and Indonesia have sufficient reserves. Indonesia is the world's third-largest coal exporter and is the largest producer of coal in Southeast Asia. Its output accounts for about 75% of the total coal exporters in the entire Southeast Asian region. Vietnam is the world's second largest exporter of anthracite coal. According to official statistics of Vietnam, the country's coal reserves are about 3.5 billion tons, mainly in the northeast, and its major markets are Japan, China, Europe, and Thailand.

In terms of coal transportation, thermal coal and coke are the main components of coal. Coal is mainly used to generate electricity and produce energy, and 40% of the world's electricity generation comes from thermal coal. Coke is mainly used to produce steel, so the demand for coke is also great. Demand for transport of coal by handysize vessels in Asia In addition to Singapore and Cambodia, other countries have coal resources, Vietnam and Indonesia are rich in coal resources, and Australia is an important country for global coal exports.

Table 3-2 International maritime trade in dry bulk cargo by sea, 2002-2017 (billions of tons)

Year	Iron ore	coal	grain	Small dry bulk cargo	Total
2002	4.493	5.461	2.338	11.462	23.754
2003	4.772	5.565	2.320	11.992	24.648
2004	5.124	5.994	2.346	12.699	26.162
2005	5.891	6.409	2.252	13.893	28.445
2006	6.596	6.711	2.484	14.662	30.453
2007	7.087	7.122	2.555	15.362	32.127
2008	7.726	7.620	2.773	16.372	34.490
2009	8.371	7.898	2.847	16.021	35.137
2010	8.968	8.042	2.981	14.023	34.013
2011	9.895	9.259	3.175	15.779	38.109
2012	10.496	9.981	3.158	16.824	40.459
2013	11.071	11.110	3.454	17.362	42.998
2014	11.876	11.824	3.633	18.230	45.564
2015	13.399	12.164	4.078	18.443	48.084
2016	13.636	11.377	4.293	18.721	48.027
2017	14.181	11.419	4.504	18.743	48.847

Data Sources: Clarkson

3.2 Supply of handysize market

Fleet growth is the most important indicators to measure supply of handysize market. The speed of growth is expected to be slow in the handysize fleet. Low orders will limit the growth of the fleet. Currently, orders only account for 6% of the total. In 2016, the percentage of handysize orders in the fleet was 13.5%. In addition, new building activities are also curbed. In the first quarter of 2018, the shipowners

invested 120 million U.S. dollars in the new building market. The shipper will give priority to large ships in order to take advantage of economies of scale. This trend will continue in 2018. Orders can only be placed on large handysize ships and can only be placed in Japanese ports. Since no Chinese owners had ordered handysize ships in the first quarter, Chinese ports were still idle.The table 3-1 shows the fleet changes of handysize ships. From the table we can see that the order book was declining from 2016 to 2018. The increased fleet supply and the decline of commodity trade discourage the rise of charter market in the first quarter of 2018. Short-term weakness in commodity markets did not inhibit optimism traders and the end of the first quarter of this year charter rates pf handysize up to $ 10,000.

Table 3-3 Fleet changes

	Order book		Orders Placed		Deliveries		Sales for Demolition	
	No.	Dwt	No.	Dwt	No.	Dwt	No.	Dwt
2016	277	9,889	6	143	128	4,587	131	3,640
2017	174	5,905	36	1,067	93	3,353	68	1,632
2018*	155	5,318	5	187	20	708	7	138
4Q16	277	9,889	4	66	15	561	15	390
1Q17	247	8,771	5	164	39	1,466	21	473
2Q17	188	6,584	5	164	29	1,019	29	718
3Q17	168	5,875	12	401	17	563	12	271
4Q17	174	5,905	14	338	8	304	6	169
1Q18	155	5,318	5	187	20	708	7	138

Source: Drewry Maritime Research

3.3 Factors influence handysize shipping market

Stochastic events that disrupt the stability of the economic system may have an impact on the cyclical process. Weather changes, wars, new resources, changes in commodity prices are candidates. These are different from the cycle because they are unique and usually caused by certain specific events. Their impact on the shipping market is often very serious.

The most important impact on the shipping market is economic shocks. These are specific economic disturbances that are superimposed on the business cycle and are often accompanied by dramatic effects. Some economists believe that the entire cyclical process can be explained by a series of random shocks that cause the economy to oscillate at a "resonant frequency." The peculiarity of these economic shocks is that their timing is unpredictable and they can lead to sudden and unexpected changes in ship demand.

In addition to economic shocks, political events such as local wars, revolutions, political nationalization of foreign assets, or strikes may disrupt trade. Such incidents do not necessarily directly affect the demand of the ship, and usually their indirect consequences are important. The regularity of political events has changed the situation of the shipping market in some way. This is quite alarming.

In summary, any balanced view of the development of the shipping market must take into account potentially important facts of a political nature. This type of information often exceeds the experience of market analysts, with the result that very few market forecasts have taken these factors into consideration.

3.3.1 China join WTO

In 2001, after China's accession to the WTO, freight rates rose sharply. Accession to the WTO has provided a stable multilateral trading environment for the development of China’s foreign trade. Under the current trend of economic globalization, China's accession to the WTO has enabled resources to enter the international optimal distribution channels. With the help of China's labor force, land, natural resources and government's macro-control capabilities, and other advanced resources, advanced technologies and management, and complementary advantages. After China's accession to the WTO, China further reduced tariffs and further reduced non-tariff barriers. At the same time, China also enjoys the most favored nation status of the WTO countries.

After China’s accession to the WTO, China’s trade with other countries in the world has increased significantly. The trade volume among WTO member states accounts for more than 90% of the world trade volume, while the trade volume with the member states of the World Trade Organization accounts for about 90% of China's foreign trade volume. Shipping is the main mode of transportation for Chinese foreign trade goods. About 88% of foreign trade goods are shipped by sea. After joining the WTO, China’s tariff and non-tariff measures have also been significantly reduced, and more foreign products have entered the Chinese market. Therefore, the total shipping volume in China's shipping market has increased significantly. Ports and shipping industries, as well as foreign shipping, logistics and shipping agencies and other related industries have ample supply.

After joining the WTO, with the gradual reduction of import tariffs, the Chinese shipping industry will effectively improve the situation of attracting foreign investment, which will benefit the advanced overseas technology and management experience of China's ports and shipping. Enterprises, export-oriented, internationalization and modernization are in a faster direction. At the same time, competition will surely increase. This will bring external pressure on domestic shipping companies, forcing them to improve their management level and service

quality, further improve their international competitiveness, and open up a new type of international shipping market that focuses on third-country shipping. Therefore, after China's accession to the WTO, it will not only bring sufficient funds for China's shipping industry, but also bring advanced equipment, technology, management concepts and methods, and accelerate the modernization of China's shipping industry.

3.3.2 Financial crisis

In 2008, freight rates fell sharply under the global financial crisis. Global economic integration has made the world shipping market highly relevant to the world economy. The world shipping market is at the end of the world economy. According to the whiplash effect, the financial crisis triggered by the United States has resulted in a 1:10 ratio of the world economy to the shipping economy. In other words, a 1% drop in world economic growth will result in a 10% decline in the global shipping market. Prices have plummeted, trading volume has fallen sharply, and popularity has plummeted.

Before the financial crisis, the shipping industry was in a good situation, which led to the rapid expansion of the entire industry and the significant increase in new orders, which brought potential hidden dangers to the shipping supply in the future. The liquidity crisis brought about by the financial turmoil has impeded the normal development of global production trade and economic activities. The sluggish economic growth in various countries and weak consumption have seriously affected global trade. The sluggish consumer spending of advanced economies such as the United States, Europe, and Japan hindered the recovery of their demand in a short period of time and brought a substantial blow to China’s export-oriented economy. The international dry bulk market began to decline after reaching a record high in May 2008, especially in the second half of 2008. With the spread of the financial crisis, the international dry bulk market has experienced a sharp decline.

Although the current market has bottomed out, BDI has returned about 2,000 points.

However, the economic environment is still in a sluggish state and the demand is weak. It is difficult for ships' profit to offset operating costs. In 2009, the dry bulk shipping market will still have a lot of new capacity. Although shipping companies have adopted measures such as postponing the opening of new ships or placing fewer orders, the capacity of transport capacity is relatively high relative to demand. Since the fourth quarter of 2008, the general cargo market has been affected by the global financial crisis. The operation of general cargo fleets is facing difficulties, mainly due to the decline in the number of fixed-liner routes and the decline in freight rates. There are fewer goods on the market than ships, and many competitors are bargain-hunting and fiercely competitive.

In the first quarter of 2008, the Maersk Group lost a total of 47 million U.S. dollars. The reason is that fuel costs have surged by 65% over the same period in 2007. In 2008, the impact of crude oil prices was huge. A record high of $147.27 per barrel. Fuel costs account for a significant portion of the total cost of the shipping business. The international crude oil market reached a new high. The normal operation of shipping logistics companies has brought great pressure on the company. A recent report released by a well-known shipping company in China shows that the company's fuel costs account for 21% of the total cost of 24%. With oil prices rising by 10%, the company's total cost will increase by 2.3%. Face high oil prices. The global shipping company set off the "Big slowdown" campaign and tried its best to reduce fuel consumption and reduce corporate costs. However, it could not fundamentally solve the high cost of the shipping and logistics industry.

3.4 Impact of global sea transport market

3.4.1 Shipping market demand

(1). world economy

Undoubtedly, the single most important effect on ship demand is the world economy.

There should be a major relationship between the world economy because of the import of manufacturing raw materials or manufacturing products that generate most of the shipping needs, so only close relationships can be expected. Therefore, judging the trend of the shipping market requires understanding the latest knowledge in the development of the world economy. However, the relationship between ocean trade and world industry is not simple or direct.

Two different aspects of the world economy may lead to changes in shipping needs: business cycles and trade development cycles. The business cycle laid the foundation for the freight cycle. The fluctuation of the economic growth rate affects the maritime trade and forms a cyclical pattern of ship demand. The world economic cycle is always reflected in the sea trade cycle. The business cycle is very important to anyone who analyzes the needs of the shipping market model.

Most economists today believe that these economic cycles are the result of external and internal factors. External factors, including sudden changes in the prices of commodities such as wars and crude oil, caused sudden changes in demand. Internal factors refer to the dynamic structure of the world economy itself, and it is believed that it naturally leads to a cyclical and non-linear growth path.

(2). Seaborne commodity trades

The relationship between maritime trade and industrial economy is divided into two parts: short-term and long-term.

An important reason for short-term fluctuations is the seasonality of some industries. Many agricultural products are affected by seasonal changes, especially cereals, sugar and citrus fruits. Cereal exports from the Gulf region of the United States reached a trough during the summer, with cereals peaking in September as crops were harvested. From September to the end of the year, trade volume may increase by 50%. Seasonally has a disproportionate impact on the spot market. The

transportation of seasonal agricultural commodities is difficult to plan, so the cargo owners of these commodities rely heavily on the spot charter market to meet their tonnage requirements. As a result, fluctuations in the food market affect the charter market more than some of the larger transactions such as iron ore tonnage requirements are largely met through long-term contracts. Some agricultural products such as fruits, meat and dairy products need to be refrigerated. By studying the economic characteristics of the industries that produce and consume commodities for trading, the long-term trend of commodity trade can be well defined.

The relocation of industrial raw materials processing will also affect the quantity of marine cargo and the type of ship required. Take the aluminum industry as an example. The raw material for aluminum production is bauxite. It takes about 3 tons of bauxite to produce 1 ton of alumina and 2 ton of alumina to produce 1 ton of aluminum. Therefore, the commercial decision to refine bauxite into alumina prior to shipment reduced the volume of marine cargo by two-thirds. Alumina has a higher value and is used less than bauxite, so the transport requirements have shifted from larger vessels suitable for bauxite trade to smaller bulk carriers suitable for alumina.

Sometimes processing does not really reduce the quantity of goods, but it will change the transportation needs. Forest products were originally transported as logs, but as the industry has grown more complex, the logs have been processed into sawn, wood, wood or wood pulp before transport. Although this did not have a major impact on the volume of cargo, it resulted in the construction of special forest product transport vehicles.

(3). Average haul and ton miles

The demand for transportation is determined by the precise distance matrix, which determines when the voyage is completed. One ton of oil transported from the Middle East to Western Europe is five times as much as a ton of oil shipped from Turkey by Jem Khan to Marseille. This distance effect is often referred to as the

"Average haul" of the transaction. Taking into account the average amount of traffic, sea tonnage is usually measured in “ton miles”. The ton mileage can be defined as the tonnage of the cargo, multiplied by the average distance of transportation.

In recent years, the influence of ship demand on changing average traffic has been repeatedly illustrated by the closure of the Suez Canal, which increased the average distance from the Arabian Gulf to Europe from 6,000 miles to 11,000 miles. Due to the sudden increase in the demand for ships, there will be a boom in the freight market every time. Another example is the closure of the Dodillo pipeline from Iraq to Turkey when Iraq invaded Kuwait in 1990. In 1990, Iraq’s invasion of Kuwait resulted in the export of 1.5 million barrels of oil from the eastern Mediterranean every day from the Arabian Gulf.

The analysis of changes in the average volume of goods traded can be very complex and requires the provision of information in the form of detailed trade matrices, but the key issue is often just the balance between long-haul and short-haul suppliers.

3.4.2 Shipping market supply

(1). The decision-makers who control supply

The supply of ships is controlled or influenced by four groups of decision makers: shipowners, shippers/renters, bankers who finance shipping, and various regulatory agencies that make safety rules. The shipowner is the decision maker's main decision maker, order new ships, eliminate old ones and decide when to put down tonnage. The shipper can become owner himself or influence the shipowner by issuing a time limit. Bank loans can affect investment, and banks often exert pressure to lead to success in a weak market. Regulators influence supply through safety or environmental legislation that affects the fleet's transportation capabilities. As the supply of transport capacity is controlled by this group of decision makers, the supply-side relationship in the transport mode is behavioral. Shipping analysts face

the same problem, trying to determine the relationship between freight and new ship orders. The fact that high freight rates stimulated orders in the past does not guarantee that this relationship will continue in the future. Market behavior cannot be explained in purely economic terms.

(2). The merchant fleet

The starting point for discussing maritime transport supply is the merchant fleet. In practice, different types of ships do not operate in independent and self-sufficient markets. Although there are many specializations in the shipping market, the degree of substitution between various types of ships is also high. In a turbulent market, flexibility is desirable. The most striking feature of the world's merchant fleet for the past 30 years may be the rapid escalation of the ship type, especially in most areas of the fleet. In the tanker market, the average size of the tanker steadily increased until the size structure was stable in the early 1980s.

In bulk carriers, the size of the ship moves similarly upwards, but between the different ship size groups, the patterns are more evenly distributed on the handysize, and the panamax and large bulk carriers are all expanded. Larger, more efficient ships are gradually being introduced to the market and lower interest rates for smaller-sized ships. At the same time, specialized investments, such as the investment in car carriers and chemical tankers, play an important role in the development of the fleet. These apparently contradictory goals emphasize the complexity of investment decisions faced by modern shipowners.

(3). Freight revenue

The shipping supply is affected by the freight. This is the ultimate regulator that the market uses to motivate policymakers to adjust capacity in the short term and look for long-term cost reductions and service improvements. In the shipping industry, there are two major pricing mechanisms, the freight market and the liner market.

Liner shipping provides many customers with the transportation of small batches of goods, receiving goods from a wide range of customers and very competitive goods. In contrast, bulk cargo transportation is a wholesale operation that sells goods to a small number of industrial customers at individually negotiated prices. By standardizing the freight unit, containerization brings the two parts closer together economically, and in both cases, the pricing system is the center of transportation supply. In the short term, as ships adjust the speed of operations and distribute goods over and over, suppliers will respond to prices while liner operators adjust their services. In the long run, shipping costs lead to investment decisions that result in ship scrapping and ordering.

3.4.3 Summary

Freight rates link supply and demand. When the supply is tight, the freight rate increases, stimulating shipowners to provide more transportation. When they fall, it has the opposite effect. In the dynamic study of the freight determination mechanism, it was found that the time scale is very important for reaching equilibrium prices. Instantaneous equilibrium describes the day-to-day situation because "instant" ships in specific loading areas compete for available cargo. Short-term equilibrium describes what happens when ships have time to move around the world, adjust their speed or spend time in reserves. In shipping, long-term is determined by the delivery of new ships, such as 2-3 years. This feature will definitely affect the freight cycle 7-8 years.

No statistical analysis can simplify this complex economic structure into a simple prediction “rule of thumb”. The requirement for success in the shipping cycle game is lifelong experience in the shipping industry, directly linked to the world economy and politics, and a keen eye for bargaining. Decision makers who do not have an advantage in experience must rely on what they have collected from books.

CHARPTER 4 Freight data analysis

4.1 Freight data collection and statistics

4.1.1 Collection of freight data

Table 4-1 shows the 1 year time charter rate handysize bulk carrier in long run historical series from 1999 to 2018. From this table it can be seen that from 1999 to 2003, the freight is very stable . In 2004, it rise sharply, then slowly fall down until 2006.Then the freight reach the highest level in 2007 and still rise a little bit in 2008. In 2009 it falls sharply due to the financial crisis and during 2009 to 2016 it slowly fall down. In 2016 it reach the bottom. From 2017 to 2018, it has been slowly growing.

Table 4-1 1 Year Time charter Rate Handysize Bulk carrier (Long Run Historical Series)

	1 Year Time charter Rate Handysize Bulk carrier (Long Run Historical Series)
Date	$/day
1999	5,566
2000	7,112
2001	6,807
2002	6,747
2003	9,005
2004	17,323
2005	15,918
2006	14,710
2007	28,120
2008	29,486

2009	10,678
2010	15,662
2011	11,587
2012	8,234
2013	8,106
2014	9,266
2015	7,154
2016	5,759
2017	8,615
2018	10,760

Data Sources: Clarkson shipping review & outlook

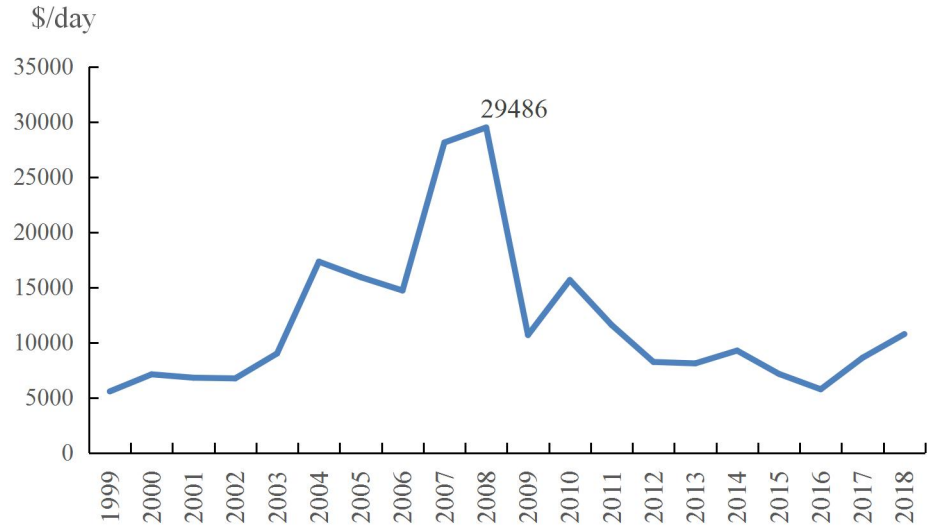


Figure 4-1 1 Year Time charter Rate Handysize Bulk carrier (Long Run Historical Series)

4.1.2 Analysis of freight data

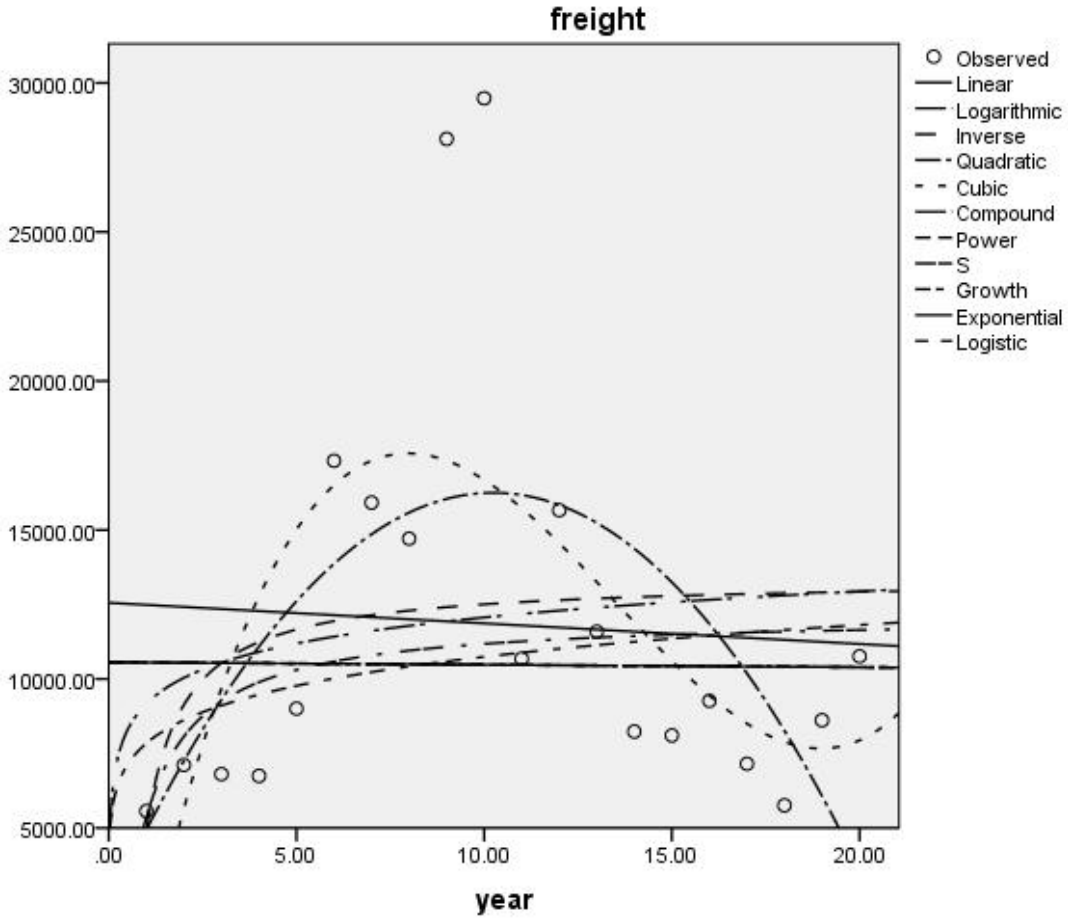
Use the regression equation fitting to analyse the freight data, the results are as follow

Model Summary and Parameter Estimates

Dependent Variable:freight

	Model Summary					Parameter Estimates			
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	0.004	0.066	1	18	0.801	12555.953	-69.067		
Logarithmic	0.023	0.42	1	18	0.525	9164.876	1259.4		
Inverse	0.077	1.51	1	18	0.235	13348.205	-8435.601		
Quadratic	0.357	4.724	2	17	0.023	2348.966	2714.657	-132.558	
Cubic	0.469	4.715	3	16	0.015	-5556.986	6748.731	-601.291	14.88
Compound	0	0.002	1	18	0.967	10561.226	0.999		
Power	0.053	1.017	1	18	0.327	7838.989	0.137		
S	0.143	3.014	1	18	0.1	9.403	-0.815		
Growth	0	0.002	1	18	0.967	9.265	-0.001		
Exponential	0	0.002	1	18	0.967	10561.226	-0.001		
Logistic	0	0.002	1	18	0.967	9.47E-05	1.001		

The independent variable is year.

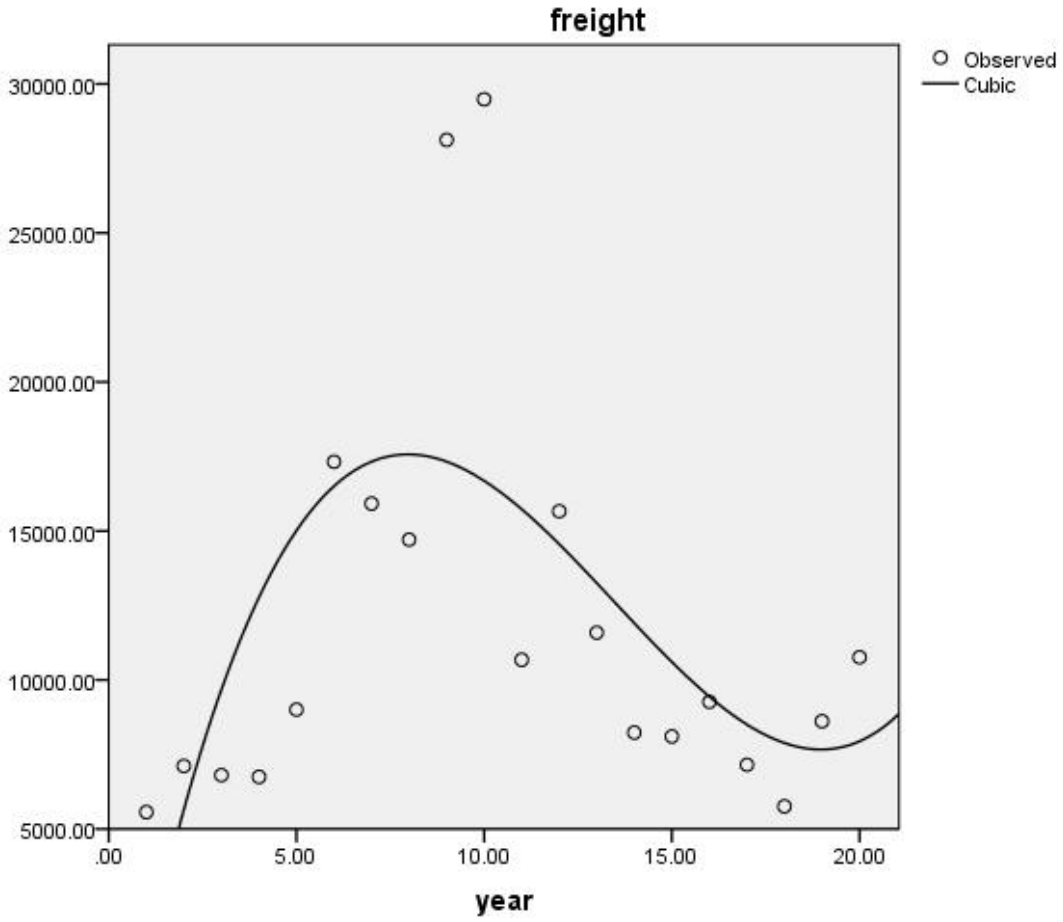


Assign a value of 1 to 1999 and increase the remaining years by 1 as an independent variable. Freight is included as a dependent variable in the regression equation. Through the model fitting we can see that the cubic function fits the highest R square

= 0.469, so we choose the cubic function。Substituting coefficients into the available regression equation is as follows：

$Y=-5556.986+6748.731X-601.291X^2+14.880X^3$ （R^2=0.689）

x:year　y：freight



Model Summary and Parameter Estimates

Dependent Variable:freight

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Cubic	.469	4.715	3	16	.015	-5556.986	6748.731	-601.291	14.880

The independent variable is year.

4.1.3 Conclusion based on the data analysis

As the global economy recovers, the demand for transportation continues to increase, which will further promote the development of the Handysize bulk carrier shipping market. Driven by the global economic recovery, international trade demand will increase, and more than 90% of global trade is completed by sea transportation, so international transportation demand will continue to increase. With the increase of international transportation demand, the development of the shipping market will be further promoted, which will be beneficial to the development of the transportation market for Handysize bulk carriers.

With the continuous slowdown in the growth rate of Handysize fleet supply, it will be beneficial to the development of the transport market for Handysize bulk carriers. In recent years, the amount of ship dismantling is relatively stable. Therefore, the development trend of Handysize ship transportation market will be better in the next few years.

In summary, with the continuous growth of global transportation demand and the continuous decrease in the growth rate of the supply capacity of handy bulk carriers, it can be concluded that in the coming years, the Handysize bulk carrier transportation market will be presented a better development trend.

4.2 The research of BHI

4.2.1 General volatility of BHI Index

As a “barometer” of the shipping market, the shipping freight index can timely reflect the trend of price changes in the shipping market. Therefore, it is necessary to analyze and forecast the trend of the shipping market in order to grasp the entire shipping market.

In general, there is a close correlation between BHI and the freight rates of major dry bulk shipping routes, and the impact of each route on BHI lag is relatively weak. BHI can accurately reflect the trend of market price changes. In essence, the freight index is subject to strong random volatility due to multiple factors, but in the long run, this volatility still has a certain degree of regularity.

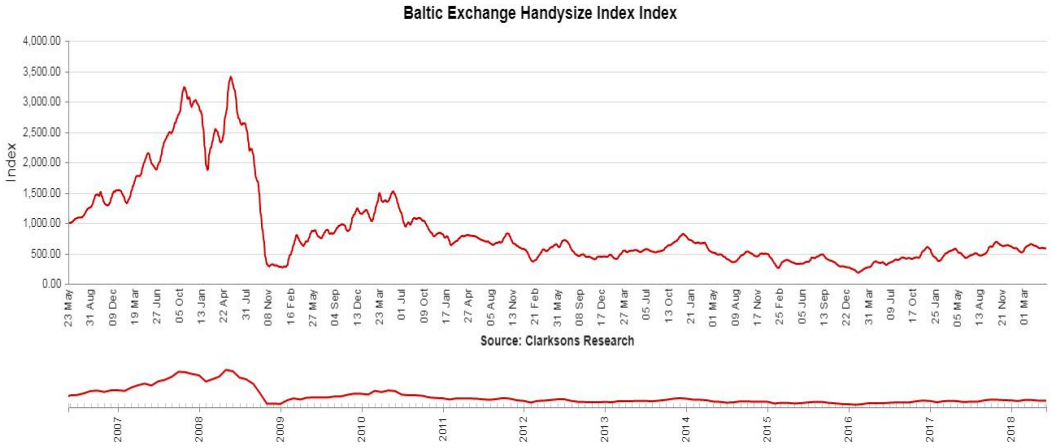


Figure 4-2 Trend of and BHI (According to quarterly statistics)

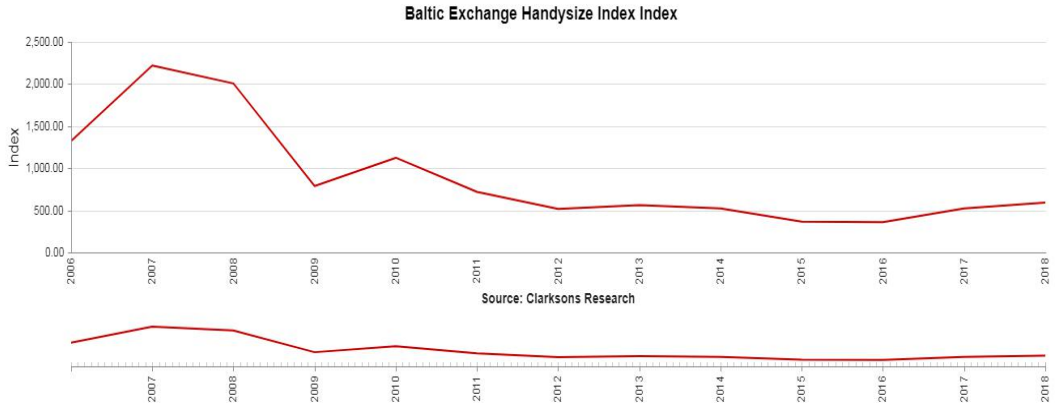


Figure 4-3 Trend of and BHI (According to yearly statistics)

Data Sources：Clarkson Research

The figure 4-1 and figure 4-2 shows how the BHI change from 2007 to 2018. We can see from the picture that the BHI was growing from past to 2007 and reach the top in 2007 and 2008. Then due to the financial crisis, BHI falls sharply until 2009. Then it rises slowly from 2009 to 2010.From 2010 to 2018, it firstly slowly fall down then become stable. The table 4-2 shows the baltic exchange handysize index from 2006 to 2018.

Table 4-2 Baltic Exchange Handysize Index

Date	Baltic Exchange Handysize Index
	Index
2006	1,321.77
2007	2,219.42
2008	2,006.21
2009	788.37
2010	1,124.24
2011	717.79
2012	516.46

2013	561.93
2014	523.56
2015	365.51
2016	360.12
2017	522.52
2018	590.51

Data Sources：Clarkson Research

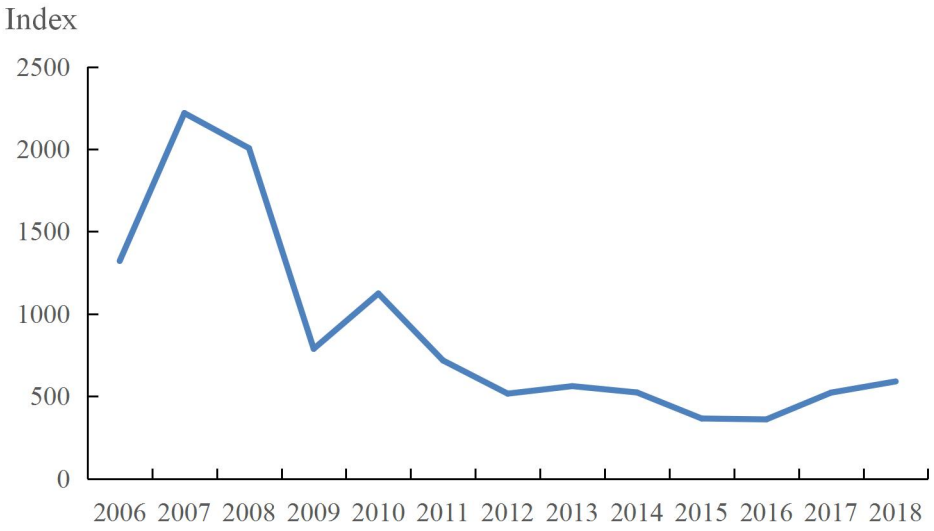


Figure 4-4 Baltic Exchange Handysize Index

4.2.2 Analysis of BHI

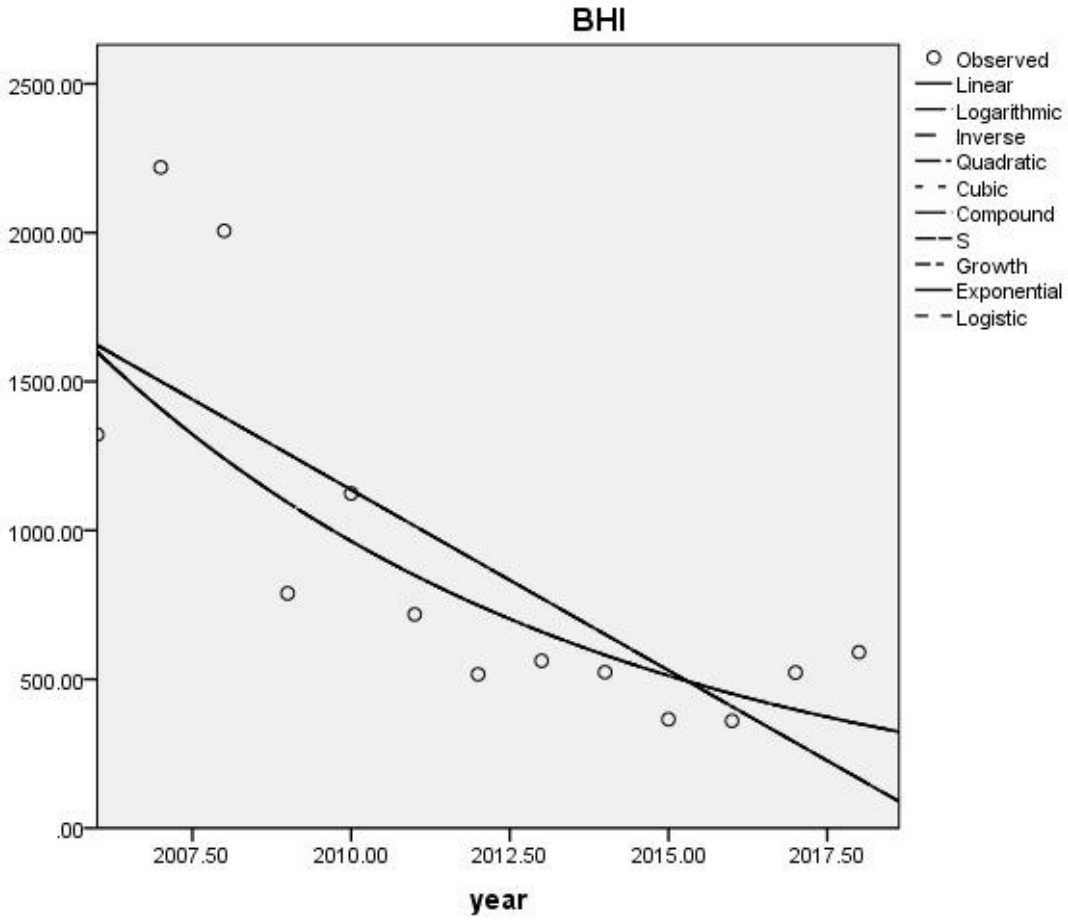
Use the regression equation fitting to analyse the BHI data, the results are as follows.

Model Summary and Parameter Estimates

Dependent Variable:BHI

	Model Summary					Parameter Estimates			
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	0.601	16.584	1	11	0.002	245011.453	-121.331		
Logarithmic	0.602	16.612	1	11	0.002	1858507.878	-244201.758		
Inverse	0.602	16.641	1	11	0.002	-243392.018	4.92E+08		
Quadratic	0.601	16.584	1	11	0.002	245011.453	-121.331	0	
Cubic	0.601	16.584	1	11	0.002	245011.453	-121.331	0	0
Compound	0.688	24.286	1	11	0	2.37E+113	0.881		
Power	0.689	24.333	1	11	0	Infinity	-254.513		
S	0.689	24.38	1	11	0	-247.971	512232.108		
Growth	0.688	24.286	1	11	0	261.055	-0.126		
Exponential	0.688	24.286	1	11	0	2.37E+113	-0.126		
Logistic	0.688	24.286	1	11	0	4.22E-114	1.135		

The independent variable is year.



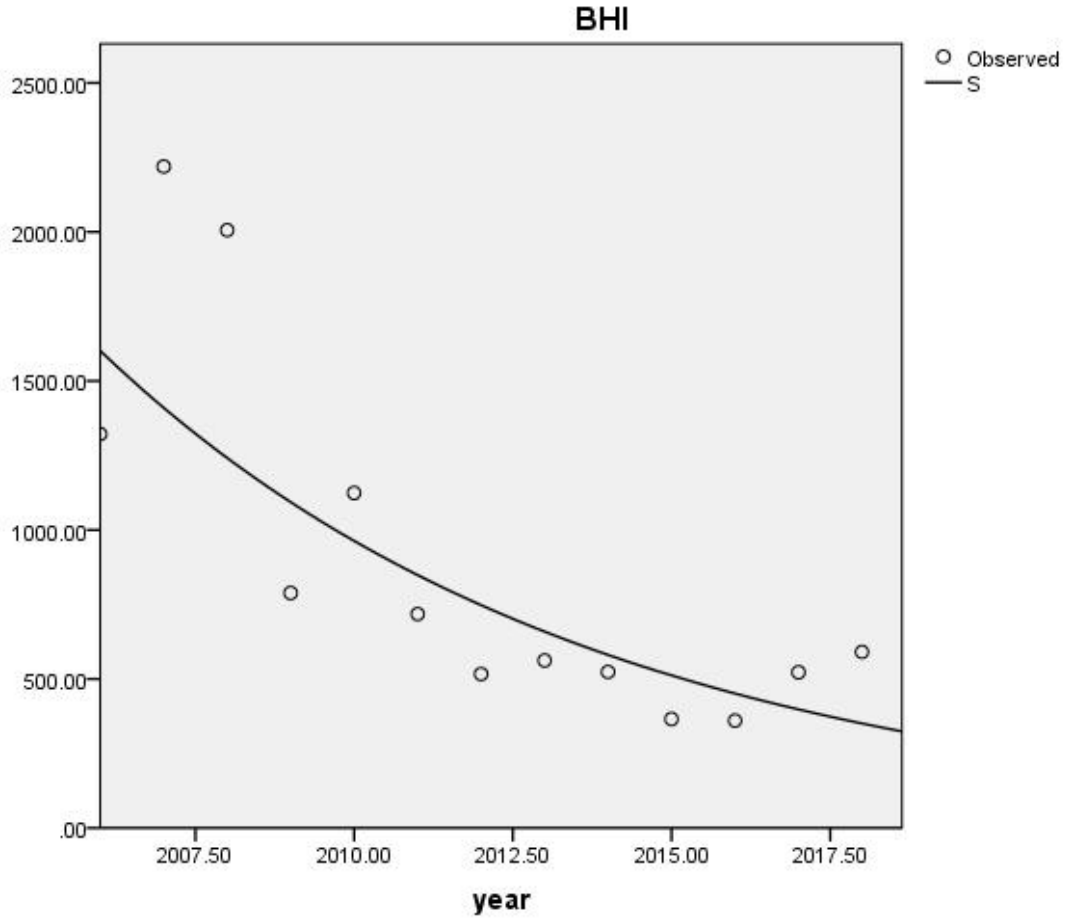
The year is used as the independent variable BHI as the dependent variable in the regression equation. Through fitting the model, we can see that the power function and the s function have the highest degree of R square = 0.689, because the constant of the power function is infinite, so we choose the s function.

Model Summary and Parameter Estimates

Dependent Variable:BHI

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
S	.689	24.380	1	11	.000	-247.971	512232.108

The independent variable is year.



Substituting coefficients into the available regression equation is as follows:

Y= e (512232.108/x-247.971) （R^2=0.689）

x:year y：BHI

4.2.3 Conclusion based on the research of BHI

In summary, BHI and the he freight rate of major dry bulk shipping routes have a close correlation. It means that BHI can reflect the trend of shipping market price changes, and the impact of each route on BHI lag is weak. In essence, the freight index is subject to strong random volatility due to multiple factors, but in the long run, this volatility still has a certain degree of regularity. Through the research of BHI, especially the above regression equation, we can see that while time goes by, BHI declining year by year.

CHARPTER 5 Suggestions on the development of handysize market

5.1 Establish business strategy implementation goals

Clarify the implementation goals of the business strategy, turn "soft tasks" into "hard targets", implement target management, and push effective implementation of the business strategy. Implementing goal management for the implementation of business strategies requires scientific goals and execution goals. Establishing a scientific, rational and practical target system is the most important basic work. The establishment of the target system generally follows the process from top to bottom. General package Including the general goal, the sub-goal, the sub-goal and the personal goal, decomposed step by step, and implemented in layers to form a complete the multi-level target system has a vertical connection and a horizontal organic connection. Execution goal. It is the core stage of goal management. The key to the successful implementation of the target is whether to implement the guarantee measures.

5.2 Adapt to the new changes in the external market environment

The market environment is unpredictable. The marketing research department of the shipping company should pay close attention to the market dynamics and regularly report the latest developments of the shipping market to the superiors, so that the shipping companies can adjust the business strategy of the handysize fleet according to the latest changes in the international dry bulk shipping market. The implementation steps and objectives of the strategy are to be market-oriented and take the road of innovation and development.

5.3 Establish a management strategy evaluation index system

The implementation of the business strategy is part of the daily operation of the shipping company. In order to effectively promote the full implementation of the strategy, and evaluate the effectiveness of the strategy implementation, measure the pros and cons of the strategy, and provide support for the development and selection of the management strategy of the future flexible fleet. For decision-making reference, shipping companies should establish a set of evaluation indicators system for the implementation of strategy in combination with the implementation objectives of the business strategy.

CHARPTER 6 Conclusion

To finish this paper successfully, firstly, several data have found by browsing the authoritative shipping website and database. Through the freight rate of handysize ships, we can master the change situation. In conclusion, the freight rate of handysize ships was growing stably from1999 to 2004, then slowly declined from 2004 to 2006. There was a sharply growth from 2006 to 2008 and freight rate reach the top in 2008. Then it went down from 2008 to 2016 and reached the bottom in 2016.

Then the paper adopts both theory and demonstration, combines quantitative analysis and qualitative analysis to find the main factors influence handysize shipping market. The paper considers numerous factors, including demand, supply, impact of global sea transport market and so on. In the process of quantitative analysis, the liner regression are used.

After the analyse using the liner regression, we can found that the freight rate data does not have a strong relationship with years and the regular pattern is very difficult to figure out. Although the world economy is growing and becoming better day by day, the influence on freight rate is not very obviously. We can not say that time do not influence the freight rate , because firstly time influence the world economy, secondly the world economy influence the supply and demand of the shipping market, thirdly the supply and demand influence the freight rate. So combine with the supply and demand of handysize shipping market now, the freight rate of handyzise ships will slowly rise in the coming one to four years, if there are not some important random events.

Reference

Bai, S. (1999). In recent years, handymax bulk carrier ship type development and our hospital research on the ship type. *Ship Design Communication, 2.*

Clarkson Research Studies. (1998-2018). Retrieved February 20, 2018, from https://www.clarksons.net/.

Jiang, D. N. (2008). Research on the fluctuation of freight index of Chinese export containers based on the Markov Mechanism conversion model .*Mathematical statistics and management*, *3*, 511-514.

Li, P. F. (2009). Focusing handymax . *Oceanographic Information, 3*.

Li, Y. D. & Zong, B. H. (2006). Baltic Freight Index Fluctuation . *Journal of Shanghai Maritime University, 4*, 84-87

Nie, J. L. & Li, X. Y. (2009).Research on ARFIMA model of baltic dry freight index. *China water transport*, *4*, 57-58.

Shu, K. (1996). Supply and Demand of Handymax Market and Its Prospect. *Navigation Science & Technology, 11*.

Yang, H. L. ,Liu, J. X. & Fan, Y. H. (2011). Baltic dry bulk freight index volatility. *China Shipping, 3*.

You, X. H. (1996). Handy bulk carrier shipping market analysis and forecast. *World Shipping, 1.*

Zhang, B. (2008). Lifting super handymax ships . *Marine intelligence, 5.*

Zhang, J. , Zeng, Q. & Zhao, X. (2014). Forecasting Spot Freight Rates Based on Forward Freight Agreement and Time Charter Contract . *Applied Economics, 46(29): 3*639-3648.

CHEN, S. , MEERSMAN, H. & VANDE, V. E. (2010). Dynamic Interrelationships in Returns and Volatilities Between Capesize and Panamax Markets. *Maritime Economics & Logistics, 12(1):* 65-90.

YU, J. , & MEYER, R. (2006). Multivariate Stochastic Volatility Models: Bayesian Estimation and Model Comparison . *Econometric Reviews, 25 (2-3):* 361 -384.

HSIAO, Y. J. , CHOU, H. C. , & WU, C. C. (2013). Return Lead-Lag and Volatility "Transmission in Shipping Freight Markets. *Maritime Policy & Management* ,1-18.

DAI, L. , HU, H. & CHEN, F. (2014). Volatility Transmission in the Dry Bulk Newbuilding and Secondhand Markets: An Empirical Research. *Transportation Letters, 6(2)* : 57-66.

Kavussanos, M. & Dockery, E. (2001). A Multivariate Test for Stock Market Efficiency: The Case of ASE, An Plied Financial Economies.*Taylor and Francis Joumals. ll(5)*: 73-79.

Beenstock, M. & Vergottis, A. (1989). An Econometric Model of the World Shipping Market for Dry Cargo, *Freight and Shipping.Applied Economic. 1989,21(a)*: 339-356.

Kevin, C. (1992). A Short-Tme Adoptive Ofrecasting Model Ofr BIFFEX

Speculation: A Box-Jenkins. *Maritime Policy & Management,* Vol 19, No.2.

Veenstra, F. (1997). A Con-Integration Approach to Forecasting Feight Rates in The Dry Bulk Shipping Sector. *Transportation Research Parta*, No.6.

Ir.Serge,Scory. (2005). The Use of Mathematical Models for Estimating Oil Pollution Damage at Sea. *Marine Resource Damage Assessment, Liability and Compensation for Environmental Damage*, 211-252.

Leendertse, J. J. (1970). A water-quality simulation model for well-mixed estuaries and coastal seas . *Principles of Computation.*